Toward Volatile Metal Complexes of Rutherfordium. II. Thermochromatography of Hf Hexafluoroacetylacetonate Complexes

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The synthesis of volatile hexafluoroacetylacetonate (hfa) complexes of zirconium (Zr) and hafnium (Hf) is described in another contribution to this annual report [1]. For a schematic of the setup used for the studies described here, we refer to Fig. 1 in [1]. In this report, we will present two aspects of these studies in more detail.

THERMOCHROMATOGRAPHY OF Hf-hfa COMPLEXES

The adsorption behavior of the formed compounds was investigated in on-line thermochromatography (TC) [2] experiments by introducing them into an open quartz column (i.d. 4 mm) with a negative longitudinal temperature gradient from +75 to -50°C. It is not possible to use a lower minimum temperature because macro amounts of hfa present in the carrier gas deposit at about -65°C. The distribution of ^{169}Hf was measured on-line with a HPGe γ-detector using a lead collimator with a window of 2-cm width.

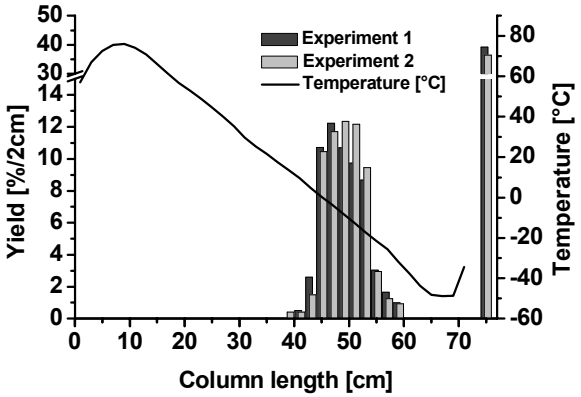

FIGURE 1: Thermochromatogram of ^{169}Hf ($T_{½}$=3.24 min). Two experiments conducted under identical conditions are shown. The temperature gradient is indicated (right-hand scale). An activated charcoal trap (ACC) was mounted after the exit of the TC column to retain ^{169}Hf that passed through the column.

The measured thermochromatogram is displayed in Figure 1. Each 2-cm section of the column was externally counted for 2 min while the beam was on. A considerable fraction of the transported ^{169}Hf passed through the chromatography column and reached an activated charcoal (ACC) trap that was installed after the exit of the column. Such traps absorb 100% of the formed species. The remainder of the ^{169}Hf deposited at temperatures between 0 and 20°C. This is in contradiction to the deposition temperature of 40°C reported in [3].

More detailed studies of the thermochemistry of this system are under way.

SEPARATION OF Zr FROM Y

In the irradiation of a ^{nat}Ge target with 85 MeV ^{18}O, several isotopes of Y are formed directly in p*x*n reactions. γ spectra of a catcher foil mounted inside the Recoil Transfer Chamber (RTC) [1,4] to catch all nuclear reaction products entering the RTC indicate the presence of several Y isotopes. γ spectra of the ACC trap installed after the exit of the TC column (the minimum temperature was -4 °C in this experiment) did not reveal the presence of any Y isotopes, indicating a separation of Zr from Y.

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